

2. *S. Raschi*, Lovén.

This species is apparently gregarious, and is enormously abundant in patches here and there from the Færöes to the Strait of Gibraltar at depths of from 100 to 300 fathoms.

Of the twenty-seven species observed, six (namely *Echinus Flemingii*, *Sphærechinus esculentus*, *Psammechinus miliaris*, *Echinocyamus angulatus*, *Amphidetus ovatus*, and *Spatangus purpureus*) may be regarded as denizens of moderate depths in the "Celtic province," recent observations having merely shown that they have a somewhat greater range in depth than was previously supposed. Probably *Spatangus Raschi* may simply be an essentially deep-water form having its headquarters in the same region. Eight species (*Cidaris papillata*, *Echinus elegans*, *E. norvegicus*, *E. rarispina*, *E. microstoma*, *Toxopneustes dröbachiensis*, *Brissopsis lyrifera*, and *Tripylus fragilis*) are members of a fauna of intermediate depth; and all, with the doubtful exception of *Echinus microstoma*, have been observed in comparatively shallow water off the coasts of Scandinavia. Five species (*Cidaris affinis*, *Echinus melo*, *Toxopneustes brevispinosus*, *Psammechinus microtuberculatus*, and *Schizaster canaliferus*) are recognized members of the Lusitanian and Mediterranean faunæ, and seven (*Porocidaris purpurata*, *Phormosoma placenta*, *Calveria hystrix*, *C. fenestrata*, *Neolampas rostellatus*, *Pourtalesia Jeffreysi*, and *P. phyle*) are forms which have for the first time been brought to light during the late deep-sea dredging-operations, whether on this or on the other side of the Atlantic: there seems little doubt that these must be referred to the abyssal fauna, upon whose confines we are now only beginning to encroach. Three of the most remarkable generic forms, *Calveria*, *Neolampas*, and *Pourtalesia*, have been found by Alexander Agassiz among the results of the deep-dredging operations of Count Pourtales in the Strait of Florida, showing a wide lateral distribution; while even a deeper interest attaches to the fact that while one family type, the Echinothuridæ, has been hitherto known only in a fossil state, the entire group find nearer allies in the extinct faunas of the Chalk or of the earlier Tertiaries than in that of the present period.

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 MISCELLANEOUS.

*On Thread-cells and Semen in Marine Sponges.* By T. EIMER.

THE researches which have been made during the last few years on sponges have led to the recognition of striking affinities between these animals and the Cœlenterata; nevertheless certain important differences in their organization and, in particular, in their histological structure even recently checked those who would have been most disposed to unite these two groups. M. Häckel said, in 1869:—"The complete absence of the urticant organs in all the Sponges, the constant presence of these same organs in all the Coralliaria, the Hydromedusæ, and the Ctenophora, constitute at present the sole morphological character which separates in a clear and definite manner the first of these classes from the three others. I have in con-

sequence proposed already, in my monograph of the Monera, and, later still, in my 'Natürliche Schöpfungsgeschichte,' to unite these three last-named classes under the ancient name of Acalephes or Cnidæ (urticant animals)."

Notwithstanding the existence of this differential character, the idea that the sponges are only an inferior group of the Cœlenterata had gained ground. Thus M. Claus, in the second edition of his work on zoology, divides the subkingdom of the Cœlenterata into three classes—namely, the Spongiæ, Anthozoa, and Ctenophoræ. This grouping, which might appear rather rash, has just been confirmed in a striking manner by the discovery, due to M. Eimer, of urticant organs in the sponges. This naturalist has observed some organs of this nature in a certain number of siliceous sponges more or less related to the *Reniere*.

In one species with remarkably viscous sarcode the urticant cells are found disseminated without any regular arrangement, but nevertheless frequently round the spicules, and most frequently surrounding throughout their whole extent the openings which give access to the afferent currents. They cover in particular abundance the cavity of the stomach; it seems, on the contrary, that they are wanting at the surface of the animal. Their form is an abbreviated oval, as in many of the Cœlenterata. Amongst those which are completely developed, numerous cells in the course of formation are found.

The second species which has presented urticant cells has oscula opening most frequently on papilliform eminences and conducting into canals lined with an extremely distinct membrane. It is this membrane which is furnished with urticant cells, in all degrees of development; they are more spherical and a little smaller than in the preceding species. Where the canals abut on the exterior surface of the body, they give place to ordinary cells.

A third species of sponges with urticant cells approaches very closely to the preceding, but differs from it by the absence of a cutaneous layer and in the nature of its spicules. The canals serving for the passage of the efferent currents are of the same width, and have the same arrangement as in the preceding, except that they are only lined with a very delicate membrane—so delicate, in fact, that it is often difficult even to prove its existence. This membrane bears the urticant cells and cells of formation in all degrees of development; but the urticant cells are very rare in the midst of the others. This species, which thus forms a passage between the sponges with urticant cells and those which are destitute of these organs, may be regarded as an arrest of development of the preceding.

The fourth form has no trace of a membrane lining the tubes which serve for the passage of the efferent currents. Its tissue, in most cases, is still more delicate than that of the preceding, from which it differs also in the spicules. It is ordinarily colourless; but yet individual specimens are found which have a slight reddish-blue colour; and from these we pass to others which are of a violet-blue. Among a great number of specimens of the bluish variety, M. Eimer has found some which were filled with urticant cells of a type totally

different from that which he had observed in the other species, but bearing, like the others, very long threads. The urticant cells here not only cover the internal surface of the efferent tubes; they are diffused throughout the whole sponge, with their numerous cells of formation in all stages of development. It can be proved clearly by the latter that the essential part of the urticant cell (that is to say, the urticant organ) originates from the nucleus. The different individuals here do not present the same uniformity that is observed in the preceding species; they are seen to differ the one from the other in the numerical proportion of the cells in course of formation and those fully developed. In certain specimens we only find cells in course of formation; in others, as, for example, in the colourless variety, we no longer find even those.

M. Eimer remarks that, whilst Leuckart and Häckel think that it is through the calcareous sponges that the change from sponges to corals takes place, the discovery of the urticant cells reveals a remarkable affinity between the siliceous sponges and the Cœlenterrata.

In addition to these details on the urticant organs, the author communicates the results of his observations on the nourishment of the sponges, which consists of little Crustacea, like that of certain polypes, and on the existence in these animals of incontestable zoosperms. This is not the first time the existence of zoosperms in the sponges has been noticed. Some bodies of that nature were found by Lieberkühn in the *Spongillæ*; and other naturalists have indicated their existence in marine sponges. But several of these observations were contested; it was supposed that, in certain cases at least, flagellated cells or Infusoria had been taken for zoosperms. M. Eimer figures perfectly characteristic zoosperms which he has observed in numerous gelatinous, siliceous, and calcareous sponges. Through the tissues will be found distributed spherical or oval balls, the surface of which appears granulated. A very strong magnifying-power shows us that these granules are caused by myriads of heads of zoosperms, which have their tails turned inward. When this ball has been broken, it may be seen that the head of the zoosperm bears a well-developed anterior prolongation or beak (*Schnabel*), which is darker than the other portions of the head. Except the greater length of this prolongation, the head has quite the same form as the zoosperms in man. The tail is of extreme thinness; and we can only perceive it with a very powerful objective, such as the immersion No. 10 of Hartnack; and even then it is impossible to follow it throughout its length. We can, however, see enough of it to convince us that in the full-grown zoosperms it is of an exceptional length; often we can count 150  $\mu$ . These zoosperms originate from cells with distinct nuclei; and M. Eimer believes he has noticed that the head is formed at the expense of the nucleus, whilst the filament originates from the protoplasm. He has always found with these zoosperms numerous ova; and for these reasons he considers the sponges to be hermaphrodites.

At the same time that M. Eimer was studying the sponges at

Capri, M. Häckel was also occupied with these animals on the shores of Dalmatia, and had likewise ascertained the existence of zoosperms and ova in the calcareous and siliceous sponges\*. The results of his researches had even been published a little before the memoir of M. Eimer. The latter, however, thinks Häckel, like Huxley and Lieberkühn, had not under examination any completely developed zoosperms, but only slightly advanced forms of those elements. As, however, Häckel has observed a direct fecundation, M. Eimer hazards the supposition that there may be some sponges in which the zoosperms are arrested at one of the inferior stages of their development.—*Archiv für mikroskopische Anatomie*, vol. viii. Heft 2; *Bibl. Univ.* August 15, 1872, *Bull. Scient.* p. 350.

*Investigations upon the Development of the Gregarinæ.*

By E. VAN BENEDEN.

The investigations of M. E. van Beneden upon the *Gregarina gigantea* of the lobster confirm the observations of Lieberkühn upon the transformation of certain amœboid forms into *Gregarinæ*; only the phases are here somewhat different from those observed in the *Gregarinæ* of the earthworm. The author found, in the small intestine of the lobster, some small, finely granular, protoplasmic masses, destitute both of membrane and nucleus. These masses, which are continually changing their form, greatly resemble *Protamœba primitiva* or *P. agilis* of Häckel, from which they differ only by presenting fine molecular granulations even to the periphery, and by never emitting true pseudopodia. According to Häckel's nomenclature, these would be true gymnocytoles.

Side by side with these we find small protoplasmic globules, which differ from them only by having lost the faculty of moving and changing their form. They have no enveloping membrane any more than the former; but their spheroidal form is preserved by a peripheral layer of denser and less fluid protoplasm.

With these globular and motionless forms we find others perfectly similar to them, except that they have one or two prolongations which cannot be assimilated to pseudopodia, but rather to the movable stalk of the *Noctiluca*. M. van Beneden names these *generative cytodes*, because it is these which directly give birth to the *Gregarinæ*. When there are two prolongations, these are inserted at but a little distance apart. One of these prolongations, which is shorter and more slender and with paler outlines than the other, and only contains very fine granules, is almost destitute of mobility. When brought against a hard body, it is seen to bend; and the bend thus produced persists for a very long time. The other prolongation is considerably longer and stouter, with stronger outlines and a more refractive protoplasm. Besides a very fine punctation, it contains opaque granules, which are very numerous at its slightly widened extremity. This process is endowed with an extreme mobility, which is manifested in two modes. It may swing about like the stalk of the *Noctiluca*, or present an inflection

\* *Jenaische Zeitschrift*, vol. vi. Heft 4.